urban areas where most consumers live or those in mountaineous regions with a less favourable climate. Developments in economiccally attractive regions are completely opposite: intensification and conversion to high productive but species-poor grasslands. In both situations the result is identical: typical species become rare or disappear completely. Many once common grassland plant species and butterflies are now on Red lists.
Restoration of species-rich herbaceous vegetation has become a high priority in many countries. The present contribution aims to give an overview of techniques used and their effectiveness, with special emphasis on the role of soil manipulation. An important aspect of soil treatment is modifying nutrient availability to levels that are suitable to sustain proper functioning of the target ecosystem, in most cases this implies lowering soil fertility. However, many examples exist where –despite appearantly approriate soil manipulation- target communities do not develop at all or at least much worse as expected. An important reason may be that typical species are no longer present locally nor have sufficient dispersal capacity to reach a restored site. Recent ideas to explain such poor restoration response are that the soil community is not or ill-adapted to the target ecosystem and may supply nutrients via decomposition at a too high or too low rate. This view puts much emphasis on dispersal and establishment of the soil community as major determinants of the functioning of herbaceous communities. The present contribution will discuss to what degree there is evidence that such bottle-neck actually exists.

S-17.2

Manipulation of soil buffering and biota addition: restoration of heathlands on former agricultural lands.

Maaike Weijters[1], Roland Bobbink[1], Rudy Van Diggelen[2], Arrie Van der Bij[2]
[1]B-WARE research centre/Radboud University Nijmegen, NIJMEGEN, Netherlands
[2]University of Antwerp, ANTWERP, Belgium

To connect and reinforce existing dry and wet heathlands, agricultural areas are reclaimed and transformed into heathland. Therefore, the nutrient rich soil-layer is removed, and the natural hydrology restored. Even though abiotic conditions are suitable for the target vegetation after these restoration measured, vegetation development is not always as desired. Causes might be the dispersal limitation of plants or the relative too high soil buffering caused by liming in the agricultural past.
To maximise the restoration success, a large-scale (almost 20000 m^2) field experiment was started after topsoil removal in 2011. To better understand the role of soil pH on vegetation development, a pH gradient was created by adding elemental sulphur or lime. The constraint of limited dispersal of plants was tested by adding either fresh herbage (freshly cut hay) or sods (soil & standing vegetation) in a full factorial design with 3 replicates. The development of soil chemistry (nutrients & base cations) was measured for seven years as well as the development of the vegetation. Target was to restore a species-rich dry and wet heathland community.
In this presentation the results of this experiment will be presented. Based on the findings of this large-scale study, restoration techniques aiming on heathland restoration on former agricultural soils will be discussed.

S-17.3

Interrelations of fungal and plant community dynamics in heathland restoration through soil transfer

Dajana Radujkovic[1], Erik Verbruggen[1], Rudy Van Diggelen[2], Roland Bobbink[2], Maaike Weijters[2], Jim Harris[2], Mark Pawlett[2], Jan Frouz[2], Arrie Van der Bij[2]
[1]University of Antwerp, WILRIJK, Belgium

Heathlands in Western Europe have been in decline over the last century despite many efforts for preservation. An important cause has been large-scale conversion to agricultural lands, where often only patches of interspersed heathland vegetation remain. Previous efforts to restore agricultural land to a vegetation dominated by heather and other typical plants has proven to be difficult and results have been mixed.
Evidence suggests that apart from restoring physico-chemical conditions and ensuring plant propagule availability, also the soil microbial community may play a role in supporting heather establishment and maintainance. For instance, heather and agricultural grasslands have distinct types of mycorrhizal fungal associations, which affect plant-availability of nutrients from soil organic matter (SOM). Similarly, saprotrophic and pathogenic fungi may differentially affect heather compared to ruderal vegetation thereby stimulating the trajectory of vegetation development.
Here we studied a dry heathland restoration on former agricultural land, located within a larger matrix of primarily heather vegetation. After removal of topsoil and restoration of natural hydrology, in 2011 two factorial treatments with three levels were applied: three pH treatments (control, S addition (-pH), and $CaMg(CO_3)_2$ addition (+pH)) and three biotic treatment (control, mowed heather material added, and soil addition). We predicted that soil addition has a significant, and persistent effect on the fungal community through continuing interactions between fungi and plants. From soils in each of these treatments we followed the trajectory of fungal community development from 2011 until 2016 through a metabarcoding analysis of the ITS1 region of the fungal rRNA gene.
The results confirm our expectation that fungal communities are significantly different between the biotic treatments (control and different additions). Furthermore, this difference does not diminish through the years indicating a remarkably persistent effect of the initial fungal community state. These results may suggest potential fruitful avenues for future heathland restoration efforts.